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Energy Futures Lab



On picking winners – why renewable energy needs targeted support

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About ICEPT

- The Centre for Energy Policy and Technology
- Founded 1999. Part of Imperial College Energy Futures Lab. Cross disciplinary research on markets, technology, systems and technologies. Strong focus on innovation policy and future energy systems
- <u>www.imperial.ac.uk/icept</u>
- <u>http://www.imperial.ac.uk/energy-futures-lab</u>

UK Energy Research Centre

- The UK Energy Research Centre (UKERC) carries out world-class research into sustainable future energy systems.
- Focal point of UK energy research and a gateway between the UK and the international energy research communities.
- Interdisciplinary, whole systems research informs UK policy development and research strategy.

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• <u>www.ukerc.ac.uk</u>



Imperial College London The investment challenge means cost of capital is key



Comparing historical and projected build rates CAPEX (£m) Source: Ofgem 2009, E&Y 2009, DECC 2012, NG 2013, CCC 2013, LSE 2012, TCE 2012 see <u>www.ukerc.ac.uk/uncertainty</u>

Annual UK CAPEX £m



Low carbon is capital intensive and....

- Low carbon is price taker in most markets
- Low carbon is often inflexible or variable in operation
- Wholesale price risk, regardless of carbon price, is detrimental to low carbon investment
- Carbon prices are themselves risky/uncertain
- Low carbon is usually more expensive, for now
- Wholesale prices would need to rise to very high levels to bring on the marginal renewables needed for deep decarbonisation

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• Hence....

Feed in tariffs have been hugely important in driving investment

Number of Countries with Renewable Energy Policies, by Type, 2011–Early 2015



Figure does not show all policy types in use. Countries are considered to have policies when at least one national or state/provincial-level policy is in place.



REN21 Renewables 2015 Global Status Report

By contrast little progress with carbon pricing outside of the EU and fossil fuels still subsidised in many countries

Fixed FiT or CfD - Risk gets transferred

the idea is to reduce cost of capital by removing market risks from zero marginal cost generators



Example of policy driving innovation: PV



Key policies driving solar PV innovation and cost reductions (Gambhir et al., 2014)

But innovation takes time....



Invention, development and demonstration

Market deployment and commercialisation

Riding spherical horses in a vacuum (why carbon pricing is so difficult)

- All in all, we are left with little reason for confidence in the applicability of the Pigouvian approach...We do not know how to calculate the required taxes and subsidies and we do not know how to approximate them by trial and error.' (Baumol 1972)
- We can't "just get the prices right"
 - Damage costs and the 'right' carbon price impossible to determine
 - Marginal abatement costs are also uncertain (though falling)
- The politics are always difficult
 - Distributional impacts, competitiveness impacts, national self interest, political self interest
- Many market failures are non-price
- High carbon is 'locked in', short term price elasticities are low
- Positive externalities of innovation may be missed

Conclusions

- Carbon pricing is not 'wrong' it is just a partial solution
 - Carbon prices do not remove wholesale price risk
 - The politics of carbon pricing remain difficult
- Policy needs to take a balanced approach
 - FiTs have the right characteristics to drive investment and reduce the costs of renewables
 - Investor needs and political constraints are part of the problem policies face and not to be wished away
- We know what works and should stick with what we know

Looking forward - rethinking the nature of electricity markets?

- ALL markets bilateral, central buyer/pool, integrated monopoly created to optimise least cost despatch of fuel burning stations
- But decarbonisation means moving from commodity based to asset based systems – zero marginal cost, high fixed cost
- Cost of capital/low risk investment key to success with renewables, but we cannot have 100% + of peak load 'outside the market'
- Emerging thinking in this area, no clear winner
 - scale back ambition for renewables?
 - sharpen market signals?
 - refine capacity markets to reward flexibility?
 - pay for system not volume of use (broadband model)?
 - return to central buyer and central dispatch?